Risk and Sustainability in an integrated decision making framework: the GDSI open platform

Miraglia, Simona; Faber, Michael Havbro

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Risk and Sustainability in an integrated decision making framework: the GDSI open platform

[a,b] Simona Miraglia*, [a,c] Michael Havbro Faber

[a]*Global Decision Support Initiatives,* [b]*Department of Civil Engineering ,* [c]*Department of Management Engineering*
Technical University of Denmark (DTU) , 2800 Kongens Lyngby, DK

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In our everyday life, we face the issue of taking decisions affecting the course of our life in the short and long term and those decisions are driven by our personal and subjective judgment on which we unconsciously rely. However, when stakeholders and governments face the problem of decision making over public safety and health or sustainable development, their judgment has to be justified to the community by objective proofs. In the perspective of climate change, natural catastrophes and human induced changes to the environment, the question for sustainable development and sustainable governmental decisions is gaining more attention, beside the (multi-)risk based decision making, in a wider prospective to achieve resilient communities.

Decision theory generally investigates the mathematical relations and quantitative representations of those relations that can model the judgment and it is largely treated in many scientific fields. Different prescriptive methodologies are available, from subjective probability and utility definitions to more semi-objective ways of modelling preferences and associated uncertainties. Despite that, an holistic framework is still missing and different schools of thought arise. Moreover, the level of development in scientific computing and knowledge makes possible to forecast hazardous events and a defined set of associated consequences with their uncertainties, but in the prospective of the decision makers, this implies on one hand the possibility of a more objective ranking of alternatives and a better informed choice, on the other hand to be object of judgment by society, press, judiciary authority etc.. In addition, decision makers are facing additional challenges due to the need of integrating sustainability and environmental impact (footprint) in the consequence analysis and to assign values to those additional attribute of the decision problem.

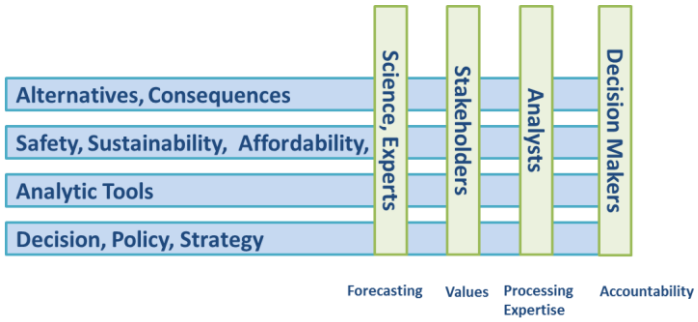

Figure 1. Elements and phases of the decision process

Taking basis on classic statistical decision theory, the authors want to provide a description and identification of elements and phase of the decision process (e.g. Figure 1), decision making models and tools with respect to both flexibility of the methods in allowing the use of multiple decision constraints (safety, affordability and sustainability indicators) and the possibility of integrating new evidences and/or changing preferences of the decision maker.

In the view of the authors, the decision making process has to be seen as a learning process over sequential evidences made available in short and future time. In addition, a generalized methodology in decision making has to assure at least the following properties: an axiomatic basis (according to Von Neumann and Morgestern classic decision theory), feasibility,

**corresponding author: simi@byg.dtu.dk*

robustness, transparency to users, compatibility with preferences of the decision maker, flexible and generalist. Thus, a generalized procedure that focuses also on the evolutionary nature of the decision maker preferences besides model updating and evidences needs to be designed.

The design of framework and open platform is a core activity of the Global Decision Support Initiative of DTU , a new founded department with the aim of providing risk and sustainability based decision making tools to better assess alternatives, consequences, uncertainties and provide a user friendly tool to various stakeholders and decision makers in Europe and worldwide.

*corresponding author: simi@byg.dtu.dk